FORM PTO-1390 (Modified) (REV 10-95) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR)
1586	09/807861

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/DE 00/02510	JULY 29, 2000	AUGUST 21, 1999

TITLE OF INVENTION
CLAW POLE GENERATOR

APPLICANT(S) FOR DO/EO/US
Gerhard PFLUEGER, Uwe KNAPPENBERGER

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ A copy of the International Search Report (PCT/ISA/210).
8. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 18 below concern document(s) or information included:

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
    A **SECOND** or **SUBSEQUENT** preliminary amendment.
16. ☐ A substitute specification.
17. ☐ A change of power of attorney and/or address letter.
18. ☒ Certificate of Mailing by Express Mail
19. ☐ Other items or information:

ET 364016001 US

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR) 09/807861	INTERNATIONAL APPLICATION NO. PCT/DE 00/02510	532 Rec'd PCT/PTO 19 APR 2001 ATTORNEY'S DOCKET NUMBER 1586

20. The following fees are submitted:.

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

		CALCULATIONS PTO USE ONLY
☐	Search Report has been prepared by the EPO or JPO	**$930.00**
☐	International preliminary examination fee paid to USPTO (37 CFR 1.482)	**$720.00**
☐	No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2))	**$790.00**
☒	Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2) paid to USPTO	**$1,070.00**
☐	International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)	**$98.00**

ENTER APPROPRIATE BASIC FEE AMOUNT =	**$1,000.00**	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).	**$0.00**	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	14 - 20 =	0	x $18.00	**$0.00**	
Independent claims	1 - 3 =	0	x $80.00	**$0.00**	
Multiple Dependent Claims **(check if applicable).**			☐	**$0.00**	
TOTAL OF ABOVE CALCULATIONS =				**$1,000.00**	
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) **(check if applicable).**			☐	**$0.00**	
SUBTOTAL =				**$1,000.00**	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). +				**$0.00**	
TOTAL NATIONAL FEE =				**$1,000.00**	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).**			☐	**$0.00**	
TOTAL FEES ENCLOSED =				**$1,000.00**	
				Amount to be: refunded	$
				charged	$

☐ A check in the amount of to cover the above fees is enclosed.

☒ Please charge my Deposit Account No. **19-4675** in the amount of **$1,000.00** to cover the above fees.
A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **19-4675** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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SIGNATURE

MICHAEL J. STRIKER
NAME

27233
REGISTRATION NUMBER

APRIL 19, 2001
DATE

UNITED STATES PATENT AND TRADEMARK OFFICE

Examiner: Group: Attorney Docket # 1586

Applicant(s) : PFLUEGER, G., ET AL

Serial No. :

Filed : Simultaneously

For : CLAW POLE GENERATOR

SIMULTANEOUS AMENDMENT

April 19, 2001

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

S I R S:

Simultaneously with filing of the above identified application please amend the same as follows:

In the Claims:

Cancel all claims without prejudice.

Substitute the claims attached hereto.

REMARKS:

This Amendment is submitted simultaneously with filing of the above identified application.

With the present Amendment applicant has amended the claims so as to eliminate their multiple dependency.

Consideration and allowance of the present application is most respectfully requested.

Respectfully submitted,

Michael J. Striker
Attorney for Applicant(s)
Reg. No. 27233

Claims

1. A claw pole generator, having a rotor (20) of claw pole construction, wherein the rotor (20) is formed of a pole wheel half (22), connected to a rotor shaft (32) in a manner fixed against relative rotation, and a pole carrier (26), also connected in a manner fixed against relative rotation to the pole wheel half (22) by a retaining means, wherein the rotor (20) has first claw poles (28) and second claw poles (29), wherein the first claw poles (28) are formed by the pole wheel half (22) and the second claw poles (29) are formed by the pole carrier (26), wherein the first claw poles (28) alternate, on the circumference of the rotor (20), with the second claw poles (29), and claw pole interstices (36) are located in the circumferential direction between the first claw poles (28) and the second claw poles (29), characterized in that the retaining means (34) is disposed at least partly in the claw pole interstices (36), and the retaining means (34) is connected by material engagement, in particular by welding, soldering or adhesive bonding, to the first claw poles (28) and to the second claw poles (29).

2. The claw pole generator of claim 1, characterized in that the claw poles (28) and the second claw poles (29) have claw pole flanks, extending in particular radially inward, and the retaining means (34) is connected at the claw pole flanks (40) to the pole wheel half (22) and to the pole carrier (26).

3. The claw pole of [one of the foregoing claims] claim 1, characterized in that the retaining means comprises many individual retaining elements (44).

4. The claw pole of claim 3, characterized in that each two adjacent retaining elements (44) are joined to one another by tabs (48) in the region of a first and a second free claw pole end (46; 47).

5. The claw pole of claim 4, characterized in that the tabs (48) are bent at an angle relative to a rotor shaft (32).

6. The claw pole of [claims 4 or 5] claim 4, characterized in that the tabs (48) located on the pole wheel half (22) and/or on the pole carrier (26) terminate flush with an axial outer side (50) of the pole wheel half (22) and/or of the pole carrier (26).

7. The claw pole of [one of claims 4, 5 or 6] claim 4, characterized in that the retaining means (34) comprises one piece, and the tabs (48) integrally connect the retaining elements (44).

8. The claw pole of claim 7, characterized in that the one-piece retaining means (34) has a substantially cylindrical-jacketlike structure, which has open recesses, alternating on the pole carrier and the pole wheel, for the first claw poles (28) and the second claw poles (29), respectively.

9. The claw pole of [one of claims 3-8] claim 3, characterized in that legs (54) extend to both sides of the first and second claw poles (28; 29) in an essentially radial direction, approximately parallel to the first and second claw pole flanks (46; 47).

10. The claw pole of claim 9, characterized in that two opposed legs (54) in a claw pole interstice (36) are each

connected by one web (56) in the region of a respective free first and second claw pole end (46; 47).

11. The claw pole of claim 9, characterized in that the legs (54) are joined on their radially inward-oriented ends (62) by a profile closing element (60), creating a closed hollow profile (61).

12. The claw pole of claim 11, characterized in that the hollow profile (61) is closed on one of its axial ends by the tab (48) and is open on its other axial end.

13. The claw pole of [one of claims 5-12] claim 5, characterized in that each two adjacent legs (54) of two claw pole interstices are connected by a pole end web (68) below the first and second claw poles (28; 29).

14. The claw pole of [one of the foregoing claims] claim 1, characterized in that at least one permanent magnet (70) is secured to the retaining means (34).

Claims

1. A claw pole generator, having a rotor (20) of claw pole construction, wherein the rotor (20) is formed of a pole wheel half (22), connected to a rotor shaft (32) in a manner fixed against relative rotation, and a pole carrier (26), also connected in a manner fixed against relative rotation to the pole wheel half (22) by a retaining means, wherein the rotor (20) has first claw poles (28) and second claw poles (29), wherein the first claw poles (28) are formed by the pole wheel half (22) and the second claw poles (29) are formed by the pole carrier (26), wherein the first claw poles (28) alternate, on the circumference of the rotor (20), with the second claw poles (29), and claw pole interstices (36) are located in the circumferential direction between the first claw poles (28) and the second claw poles (29), characterized in that the retaining means (34) is disposed at least partly in the claw pole interstices (36), and the retaining means (34) is connected by material engagement, in particular by welding, soldering or adhesive bonding, to the first claw poles (28) and to the second claw poles (29).

2. The claw pole generator of claim 1, characterized in that the claw poles (28) and the second claw poles (29) have claw pole flanks, extending in particular radially inward, and the retaining means (34) is connected at the claw pole flanks (40) to the pole wheel half (22) and to the pole carrier (26).

3. The claw pole of claim 1, characterized in that the retaining means comprises many individual retaining elements (44).

4. The claw pole of claim 3, characterized in that each two adjacent retaining elements (44) are joined to one another by tabs (48) in the region of a first and a second free claw pole end (46; 47).

5. The claw pole of claim 4, characterized in that the tabs (48) are bent at an angle relative to a rotor shaft (32).

6. The claw pole of claim 4, characterized in that the tabs (48) located on the pole wheel half (22) and/or on the pole carrier (26) terminate flush with an axial outer side (50) of the pole wheel half (22) and/or of the pole carrier (26).

7. The claw pole of claim 4, characterized in that the retaining means (34) comprises one piece, and the tabs (48) integrally connect the retaining elements (44).

8. The claw pole of claim 7, characterized in that the one-piece retaining means (34) has a substantially cylindrical-jacketlike structure, which has open recesses, alternating on the pole carrier and the pole wheel, for the first claw poles (28) and the second claw poles (29), respectively.

9. The claw pole of claim 3, characterized in that legs (54) extend to both sides of the first and second claw poles (28; 29) in an essentially radial direction, approximately parallel to the first and second claw pole flanks (46; 47).

10. The claw pole of claim 9, characterized in that two opposed legs (54) in a claw pole interstice (36) are each connected by one web (56) in the region of a respective free first and second claw pole end (46; 47).

11. The claw pole of claim 9, characterized in that the legs (54) are joined on their radially inward-oriented ends (62) by a profile closing element (60), creating a closed hollow profile (61).

12. The claw pole of claim 11, characterized in that the hollow profile (61) is closed on one of its axial ends by the tab (48) and is open on its other axial end.

13. The claw pole of claim 5, characterized in that each two adjacent legs (54) of two claw pole interstices are connected by a pole end web (68) below the first and second claw poles (28; 29).

14. The claw pole of claim 1, characterized in that at least one permanent magnet (70) is secured to the retaining means (34).

CLAW POLE GENERATOR

Prior Art

The invention relates to a claw pole generator with a rotor, as generically defined by the preamble to the independent claim.

Generators with a rotor of claw pole construction are known for instance from the publication entitled "BOSCH- Technische Unterrichtung, Generatoren" ["Bosch Technical Instruction: Generators"], 1998-99 edition. The rotor includes first a pole wheel half, connected to a rotor shaft in a manner fixed against relative rotation, and a pole carrier that is connected to the pole wheel half in a manner fixed against relative rotation by means of a retaining means. The retaining means, which is preferably not excitable magnetically, is a continuous ring, which is coaxial with the pivot axis of the rotor and has a generally rectangular cross section. The pole carrier and the pole wheel half, on the inside of the claws toward the pivot axis, each have one approximately cylindrical turned recess, into which the ring is inserted.

The rotor of this known claw pole generator has the disadvantage, among others, that the binding, which can also be embodied as a soldered connection, is made approximately in the middle between the pole carrier and the pole wheel half, by way of an only narrow axial region of the claws. Since the free claw pole ends thus project freely, they can bend open and outward under the load of centrifugal force. A further disadvantage of

the known claw pole generator is that the radially outward-oriented surface of the claw poles of the pole carrier and the pole wheel half is interrupted by the interstices between the individual claws of opposite polarity, which lessens the dissipation of the lost heat.

Advantages of the Invention

With the claw pole generator of the invention, as defined by the characteristics of the independent claim, it is possible to reduce the size of the interstices between the individual claws of opposite polarity. At the same time, the joints of the pole wheel half, retaining means and pole carrier can be reached better from outside the rotor. A connection by material engagement, as was previously attained by hard-soldering the ring to the claw poles, is now possible not only by soldering but by welding, since the intended welding points are easier to reach from outside. Because the joints can be produced by means of a different, it is possible to widen the production tolerances of the components to be joined, which are the pole wheel half, the retaining means and the pole carrier. This reduces the production effort and expense, for instance, and at the same time the production rejection rate.

Another advantage of the at least partial disposition of the retaining means in the claw pole interstices resides in the enlargement of the outer surface area of the rotor, so that heat dissipation is improved substantially. This improvement in lost heat dissipation makes higher generator power possible, so that despite the higher power, limit temperatures for

components are not exceeded.

The claw pole generator of the invention furthermore enables a connection by material engagement in the region of the free claw pole ends as well, so that the bending open of the claws under centrifugal load is reduced. This makes a smaller air gap possible between the outer circumference of the claw poles and the inner circumference of the stator.

By the provisions recited in the dependent claims, advantageous refinements of and improvements to the characteristics recited in the independent claim are obtained.

An advantageous feature of the retaining means is provided by connected two retaining elements, adjoining or bordering on a claw pole, by a so-called tab in the region of a free claw pole end. If these tabs are angled radially inward relative to the rotor shaft axis, the result is a reinforcement of the retaining means, which by its connection with the claw pole additionally reinforces the claw pole tip against widening under centrifugal load. If the retaining means with the bent tab is extended as far as an axial outer side of the pole wheel half, until it is flush with the outer side, the outer side of the rotor is improved as a result, with less fissuring. A further improvement in the retaining means is attained by embodying it as a one-piece body, on which the individual retaining element regions that are located between the various claws are disposed. By means of various reshaping processes, a one-piece retaining means is obtained that has a substantially cylindrical jacketlike structure with open

recesses, alternating on the pole carrier and the pole wheel, for the pole wheel and pole carrier claws, respectively. A reinforcement of the retaining elements can be attained by providing that radially inward-oriented legs extend from the ends adjoining the claw poles in an essentially centrifugal load. This structure is further improved in that two opposed legs in a claw pole interstice are each connected by one web in the region of a respective free first and second claw pole end. If two legs are joined on their radially inward-oriented end by a profile closing element, the result is a closed hollow profile, which is thereby reinforced further. If two adjacent legs of two respective claw pole interstices are connected by a pole end web below the first and second claw poles, then the retaining means is additionally reinforced even further. With the aid of the retaining means of the invention, it is advantageously also possible to use permanent magnets in the interstices between two claw poles of opposite polarity, to reduce the stray flux. In that case, permanent magnets can be secured, for instance to retaining means radially inside the rotor. If the retaining means is embodied, inside the interstices between two claws of opposite polarity, as a hollow profile, then the permanent magnets can be introduced by insertion into this open hollow profile.

Drawings

The invention is described in further detail below in four exemplary embodiments in conjunction with the associated drawings.

Fig. 1 shows a first exemplary embodiment of a

rotor of a claw pole generator of the invention in plan view;

Fig. 2 is fragmentary section taken along the line II- II in Fig. 1;

Fig. 3 shows a side view of a rotor in a second exemplary embodiment;

Fig. 4 shows a sectional view along line IV-IV through the rotor of Fig. 3;

Fig. 5 shows an alternative embodiment for Fig. 4;

Fig. 6 shows a perspective view of a retaining means for the rotor of Fig. 3;

Fig. 7 shows a fragmentary view of a rotor in a third exemplary embodiment;

Fig. 8 is a section through the rotor of Fig. 7 taken along the line VIII-VIII;

Figs. 9 and 10 show a refinement of the rotor of Figs. 7 and 8, in which the two inward-oriented legs are joined together by webs;

Fig. 11 shows a side view through a retaining means of a fourth exemplary embodiment;

Fig. 12 is a fragmentary cross section taken along the line XII-XII of Fig. 11;

Fig. 13 shows the retaining means of the fourth

exemplary embodiment, in which the hollow profile on the side of the pole wheel half is open;

Fig. 14 shows a side view of the retaining means in the fourth exemplary embodiment;

Figs. 15, 16 and 17 show various possible ways of securing permanent magnets to the retaining means; and

Fig. 18, in the upper half, shows a longitudinal section through a known claw pole generator of conducting piece construction, and in the lower half shows a side view of the rotor of that generator.

Identical or identically functioning components are identified by the same reference numerals.

Description of the Exemplary Embodiments

Fig. 18, in the upper half, shows a longitudinal section through a known claw pole generator with a rotor 20 of conducting piece construction. The rotor 20 has a pole wheel half 22, which is connected via a ring 24 to a conducting piece, hereinafter called a pole carrier 26. The mechanical binding between the pole carrier 26, ring 24 and pole wheel half 22 is provided by a respective soldered point between each first claw pole 28 of the pole wheel half 22 and the ring 24, and between each second claw pole 29 of the pole carrier 26 and the ring 24. The rotor 20 is concentrically surrounded by the stator 30.

Fig. 1 shows a first exemplary embodiment of a claw pole generator of the invention. The rotor 20

includes the pole wheel half 22, which is connected to a rotor shaft 32 in a manner fixed against relative rotation. The pole wheel half 22 is in turn connected, also in a manner fixed against relative rotation, by material engagement to the pole carrier 26 by a retaining means 34.

The first claw poles 28 alternate with the second claw poles 29 on the circumference of the rotor 20, spaced apart equally; between the second claw poles 29 and the first claw poles 28, there are claw pole interstices 36. The retaining means 34 of the invention is disposed at least partly in the claw pole interstices.

The first claw poles 28, with claw pole roots 38, merge with a plate 39 of the pole wheel half 22.

The first claw poles 28 and the second claw poles 29 each have approximately radial claw pole flanks 40 on the sides. The retaining means 34 is connected, both on the claw pole flanks 40 of the second claw poles 29 and on the claw pole flanks 40 of the first claw poles 28, by material engagement to both the pole wheel half 22 and the pole carrier 26. A suitable arrangement of the retaining means 34 is provided by having its surface 42 extend substantially on the circumference. The smoothest possible surface of the rotor 20 is obtained if the retaining means, with its radially outward-oriented surface 42, together with the radially outward-oriented faces of the claw poles 28 forms one common cylindrical face, as is also shown in Fig. 1. In this first exemplary embodiment of the rotor 20 of the invention, the retaining means 34 includes a plurality

of individual retaining elements 44, which are each disposed individually in the individual claw pole interstices 36, each between a respective first claw pole 28 and a respective second claw pole 29.

In Fig. 2, the location of the retaining means 34 in which it has the greatest possible spacing from the rotor axis can be seen. With its lateral faces, the retaining means 34 abuts against the claw pole flank 40 of the first claw pole 28 and of the second claw pole 29. At this abutment point, the mechanical binding takes place between the retaining means 34 and the first and second claw poles 28 and 29.

In Fig. 3, a second exemplary embodiment of the rotor 20 with the retaining means 34 is shown. This second exemplary embodiment differs from the first in that adjacent retaining elements 44 are joined together, in the region of a free first claw pole end 46 and a free second claw pole end 47, by tabs 48. These tabs 48 can be seen clearly in Fig. 4, in which the tabs are angled toward the rotor shaft 32. In Fig. 5, a variant of this bent tab 48 is shown, in which the tab 48 located on the side of the pole wheel half 22 ends flush with an axial outer side 50 of the pole wheel half 22. With the aid of this extension as far as the axial outer side 50, interstices between adjacent claw pole roots 38 are also covered, and thus the cylindrical portion of the rotor surface is enlarged. This suppresses a further source of noise.

In Fig. 6, the one-piece retaining means 34 is shown in perspective, as it is provided in the second exemplary embodiment. Here the retaining means 34 is in

one piece, and the tabs 48 integrally join the retaining elements 44. This one-piece retaining means 34 has a substantially cylindrical jacketlike structure, which has open recesses, alternating on the pole carrier and the pole wheel, for the first claw poles 28 and second claw poles 29, respectively.

In Fig. 7, a third exemplary embodiment of the retaining means 34 is shown, in a fragmentary view of the rotor. This third exemplary embodiment is based on the exemplary embodiment shown in Fig. 6. As seen in Fig. 8, radially inward-oriented legs 54 originate at the ends, adjoining the first and second claw poles 28 and 29, of the retaining elements 44. These legs 54 serve to reinforce the retaining means 34, and as a result, if the centrifugal load remains constant, the bending open of the first and second claw poles 28 and 29 is reduced again. A further increase in stability or rigidity is obtained by providing that two opposed legs 54 are joined, in the region a first and a second free claw pole end 46 and 47, by a respective web 56; see Fig. 9. In Fig. 10, the cross-sectional view of this is provided.

In Fig. 11, a fourth exemplary embodiment of the retaining means 34 is shown, in which compared with the third exemplary embodiment of Fig. 6, the legs 54 are joined on their radially inward-oriented ends by a respective so-called profile closing element 60, thus creating a closed hollow profile 61; see also Fig. 12. This fourth exemplary embodiment also has the tabs 48 already known from the second exemplary embodiment, which connect the individual retaining elements 44. As indicated by dashed lines in Fig. 12, the claw poles 28

and 29 may also have claw pole flanks 40' and 40'', respectively, which are not oriented purely radially inward but instead have a tangential component in their orientation as well. Besides these, claw pole flanks 40 that are only partly oriented purely radially inward are also possible, as in Fig. 2. In the fourth exemplary embodiment, the hollow profile 61 is open toward one axial end, while the other axial end is closed; see also Fig. 13. In Fig. 14, a fragmentary side view of the rotor 20 is shown, viewed from the pole wheel half 22 with the retaining means 34, in the form of the fourth exemplary embodiment. This shows that the hollow profile 61, which extends between a first and second claw pole 28 and 29, respectively, is open on the side of the pole wheel half 22. Because the retaining means 34 has a hollow profile 61 that is open toward the pole wheel half 22, the tab 48 accordingly also has two openings. This causes a weakening of the material comprising the tab 48. To compensate for this weakening on this end of the retaining means 34, the tab 48 on its radially inner end has an angled end region 62, which extends between two adjacent claw pole roots 38. A further improvement is obtained by providing that the angle of this tab 48 between two hollow profile openings is reinforced by an end region web 66; see also Fig. 1. To improve the joint connection between the pole wheel half 22, retaining means 34 and pole carrier 26 still further, the tab 48 is connected by material engagement, for instance by a welding point, to the pole wheel half 22 between two claw pole roots 38. A further possibility for reinforcing the retaining means 34 is to connect each two adjacent legs 54 of two claw pole interstices 36 by means of a pole end web 68 below the claw pole ends; see also Fig. 11.

To increase the power of a claw pole generator, permanent magnets 70 are in general provided. These permanent magnets 70 are each placed in the interstices between a respective first and second claw pole 28 and 29. Upon magnetic excitation of the rotor, the polarity of the first claw poles 28 is opposite the polarity of the second claw poles 29. The permanent magnets 70 are oriented such that they counteract a magnetic claw pole field, excited by an exciter coil 72, between two claw poles 28 and 29 of opposite polarity and thus reduce the stray flux. Such permanent magnets 70 can be secured, in the first and second exemplary embodiments, by way of example by adhesive bonding to the underside of the retaining element 44; see Figs. 15 and 16. If the two legs 54 form an undercut, for instance, as in Fig. 17, then it is also possible to introduce the permanent magnets 70 by providing that the hold of the permanent magnet comes about by positive engagement with the two legs 54. In the fourth exemplary embodiment, the permanent magnets 70 can be introduced into the hollow profiles 61 that are open on one end; see Fig. 14. In that case, a fixation of the permanent magnets 70 in the hollow profile 61 can be accomplished by an impregnating resin, which is introduced into the hollow profile 61 between the hollow profile 61 and the permanent magnet 70. To prevent the claw pole generator from being impaired in its function by the retaining means 34, the retaining means 34 must comprise a material that is magnetically ineffective. Particularly for the third and fourth exemplary embodiments, because of the relatively complicated shape, it is an attractive option for the retaining means 34 to be produced in one piece by precision casting of an austenitic material. The cohesion between the retaining means 34, pole wheel half

22 and pole carrier 26 is best achieved by joining these three components by means of welding, soldering or adhesive points. It is contemplated that to produce the welding points, MIG, laser or WIG method is employed.

The four exemplary embodiments described thus far pertain to rotors 20 having a conducting piece or pole carrier 26, in which the pole carrier 26 is secured to the pole wheel half 22 via the retaining means 34. In its embodiment described thus far, the retaining means 34 is also suitable for rotors 20 of claw pole design, which comprise a first pole wheel half 22 and a pole carrier 26, with the pole carrier 26 also embodied as a pole wheel half that is identical to the pole wheel half 22. While in the conducting piece construction a general holding function for the pole carrier 26 of the conducting piece construction is implicit, this is not true for the construction with two pole wheel halves 22. By its fastening to the claw poles 28 or the first claws 36 of the one pole wheel half 22 on the one hand and to the claw poles 28 or first claws 36 of the other, second pole wheel half 22 on the other, the retaining means 34 increases the resistance of the claw poles 28 to bending open, as is already the case with the conducting piece construction. Furthermore, vibration of the claw poles in a direction tangential to the rotor axis is practically prevented. In a rotor 20 having a pole carrier 26 of conducting piece construction, a distinction can be made between the first claw poles 28 and the second claw poles 29, in the sense that the first claw poles 28 have claw pole roots 38, so that a disklike region of one pole wheel half 22 has recesses between the first claw poles 28. In the previous exemplary embodiments, it is in these recesses that the

retaining means 34 is secured in these recesses by tabs, as shown in Fig. 14, or the tab 48 is located in these recesses; see also Fig. 4 and Fig. 5. While this one-sided arrangement is possible only in the rotor 20 having a pole carrier 26 of conducting piece construction, in the case of the rotor 20 with two pole wheel halves 22, it is possible to dispose the tab 48 or secure the retaining means 34 in the recesses of both pole wheel halves 22, since the rotor 20 is constructed essentially mirror-symmetrically.

Claims

1. A claw pole generator, having a rotor (20) of claw pole construction, wherein the rotor (20) is formed of a pole wheel half (22), connected to a rotor shaft (32) in a manner fixed against relative rotation, and a pole carrier (26), also connected in a manner fixed against relative rotation to the pole wheel half (22) by a retaining means, wherein the rotor (20) has first claw poles (28) and second claw poles (29), wherein the first claw poles (28) are formed by the pole wheel half (22) and the second claw poles (29) are formed by the pole carrier (26), wherein the first claw poles (28) alternate, on the circumference of the rotor (20), with the second claw poles (29), and claw pole interstices (36) are located in the circumferential direction between the first claw poles (28) and the second claw poles (29), characterized in that the retaining means (34) is disposed at least partly in the claw pole interstices (36), and the retaining means (34) is connected by material engagement, in particular by welding, soldering or adhesive bonding, to the first claw poles (28) and to the second claw poles (29).

2. The claw pole generator of claim 1, characterized in that the claw poles (28) and the second claw poles (29) have claw pole flanks, extending in particular radially inward, and the retaining means (34) is connected at the claw pole flanks (40) to the pole wheel half (22) and to the pole carrier (26).

3. The claw pole of one of the foregoing claims, characterized in that the retaining means comprises many

individual retaining elements (44).

4. The claw pole of claim 3, characterized in that each two adjacent retaining elements (44) are joined to one another by tabs (48) in the region of a first and a second free claw pole end (46; 47).

5. The claw pole of claim 4, characterized in that the tabs (48) are bent at an angle relative to a rotor shaft (32).

6. The claw pole of claims 4 or 5, characterized in that the tabs (48) located on the pole wheel half (22) and/or on the pole carrier (26) terminate flush with an axial outer side (50) of the pole wheel half (22) and/or of the pole carrier (26).

7. The claw pole of one of claims 4, 5 or 6, characterized in that the retaining means (34) comprises one piece, and the tabs (48) integrally connect the retaining elements (44).

8. The claw pole of claim 7, characterized in that the one-piece retaining means (34) has a substantially cylindrical-jacketlike structure, which has open recesses, alternating on the pole carrier and the pole wheel, for the first claw poles (28) and the second claw poles (29), respectively.

9. The claw pole of one of claims 3-8, characterized in that legs (54) extend to both sides of the first and second claw poles (28; 29) in an essentially radial direction, approximately parallel to the first and second claw pole flanks (46; 47).

10. The claw pole of claim 9, characterized in that two opposed legs (54) in a claw pole interstice (36) are each connected by one web (56) in the region of a respective free first and second claw pole end (46; 47).

11. The claw pole of claim 9, characterized in that the legs (54) are joined on their radially inward-oriented ends (62) by a profile closing element (60), creating a closed hollow profile (61).

12. The claw pole of claim 11, characterized in that the hollow profile (61) is closed on one of its axial ends by the tab (48) and is open on its other axial end.

13. The claw pole of one of claims 5-12, characterized in that each two adjacent legs (54) of two claw pole interstices are connected by a pole end web (68) below the first and second claw poles (28; 29).

14. The claw pole of one of the foregoing claims, characterized in that at least one permanent magnet (70) is secured to the retaining means (34).

Abstract

A claw pole generator having a rotor (20) of claw pole construction is proposed, wherein the rotor (20) is formed of a pole wheel half (22), connected to a rotor shaft (32) in a manner fixed against relative rotation, and a pole carrier (26), also connected in a manner fixed against relative rotation to the pole wheel half (22) by a retaining means. The rotor (20) has first claw poles (28) and second claw poles (29), wherein the first claw poles (28) are formed by the pole wheel half (22) and the second claw poles (29) are formed by the pole carrier (26). The first claw poles (28) alternate, on the circumference of the rotor (20), with the second claw poles (29). Claw pole interstices (36) are located in the circumferential direction between the first claw poles (28) and the second claw poles (29). The retaining means (34) is disposed at least partly in the claw pole interstices (36), and the retaining means (34) is connected by material engagement, in particular by welding, soldering or adhesive bonding, to the first claw poles (28) and to the second claw poles (29).

(Fig. 3)

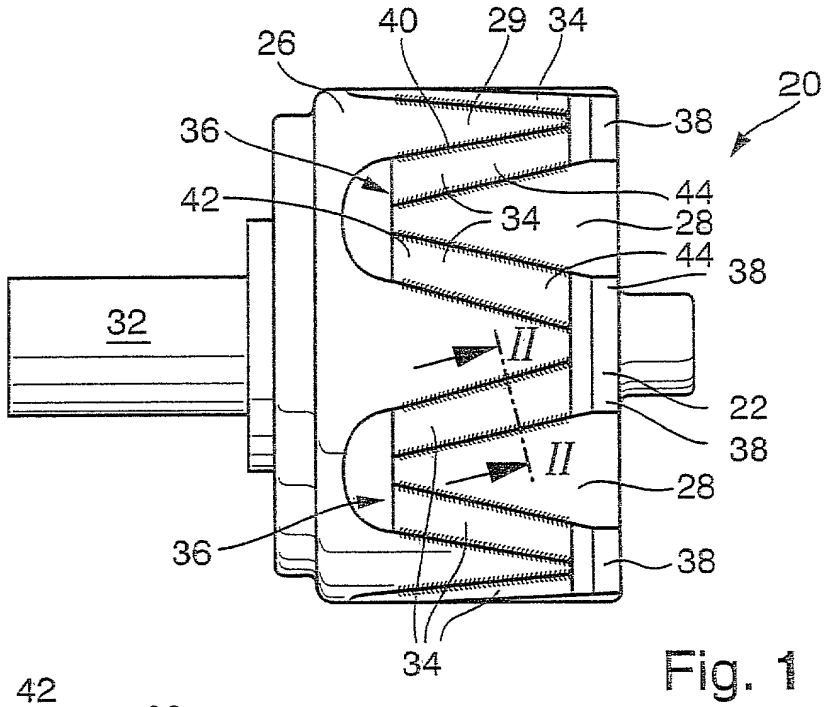

Fig. 1

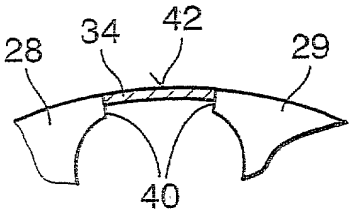

Fig. 2

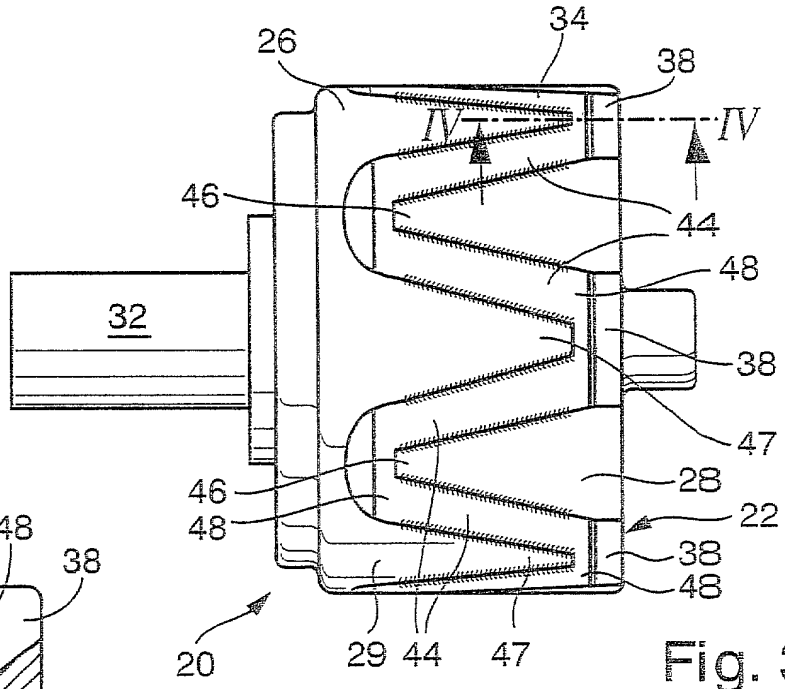

Fig. 3

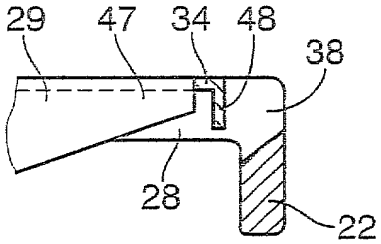

Fig. 4

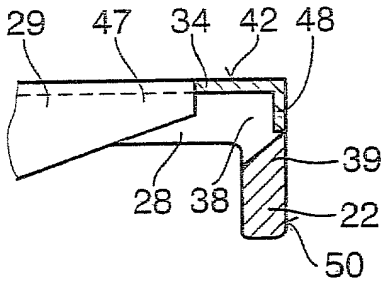

Fig. 5

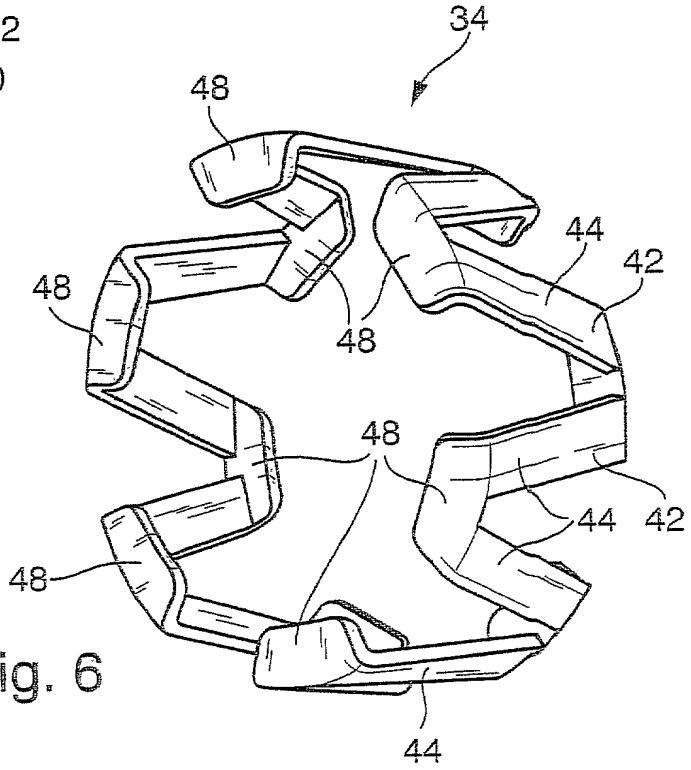

Fig. 6

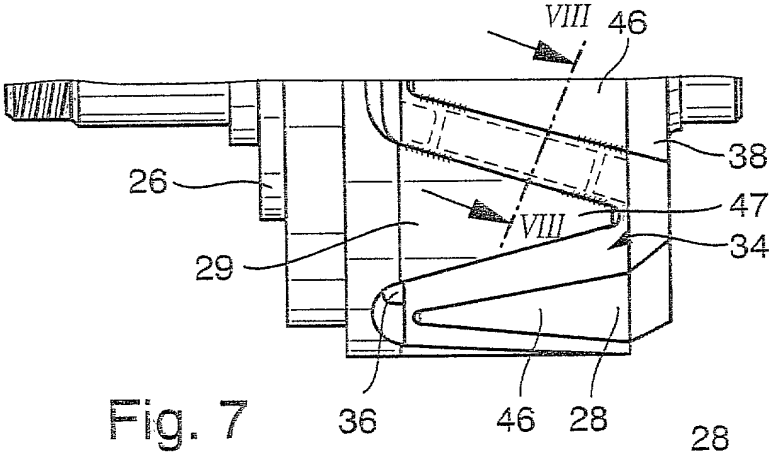

Fig. 7

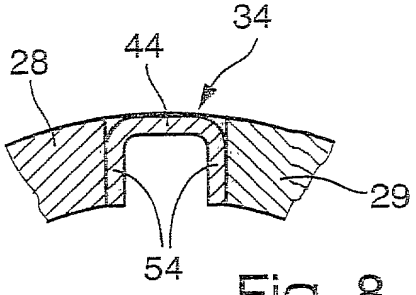

Fig. 8

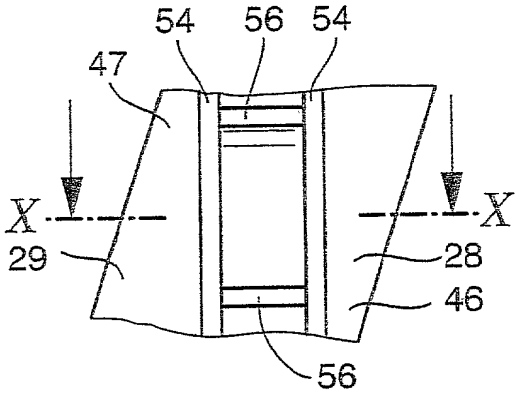

Fig. 9

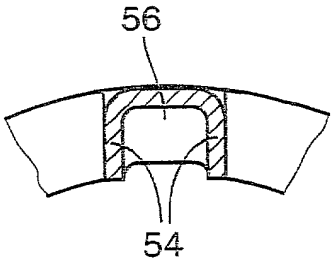

Fig. 10

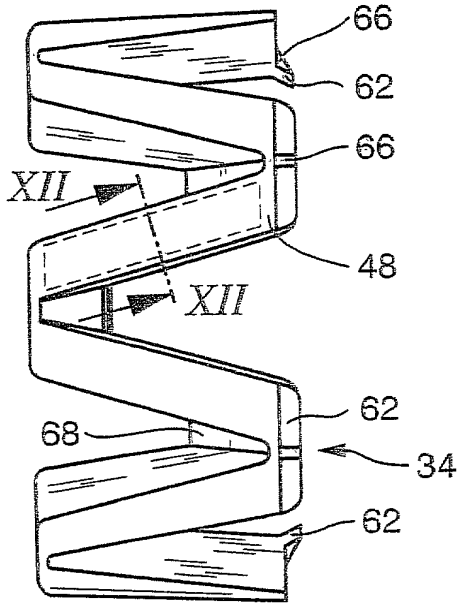

Fig. 11

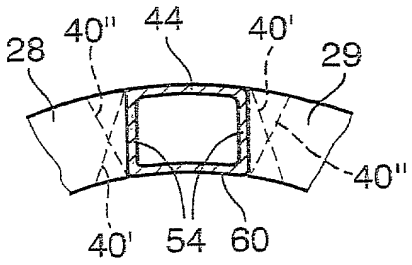

Fig. 12

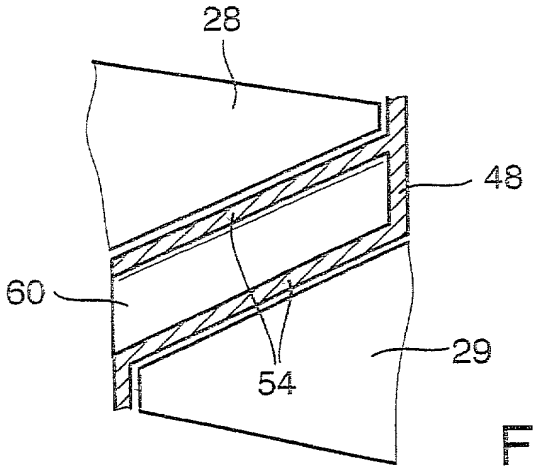

Fig. 13

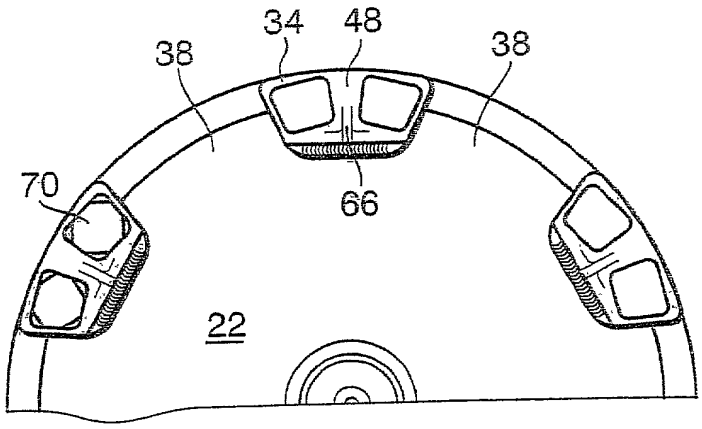

Fig. 14

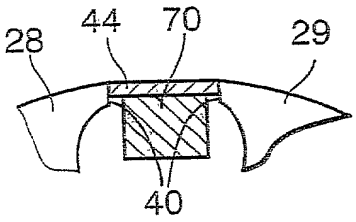

Fig. 15

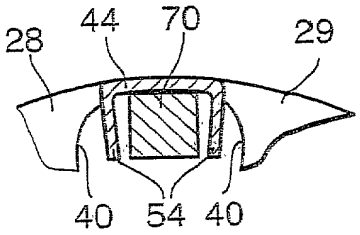

Fig. 16

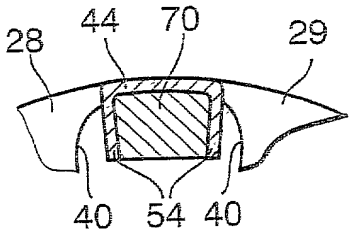

Fig. 17

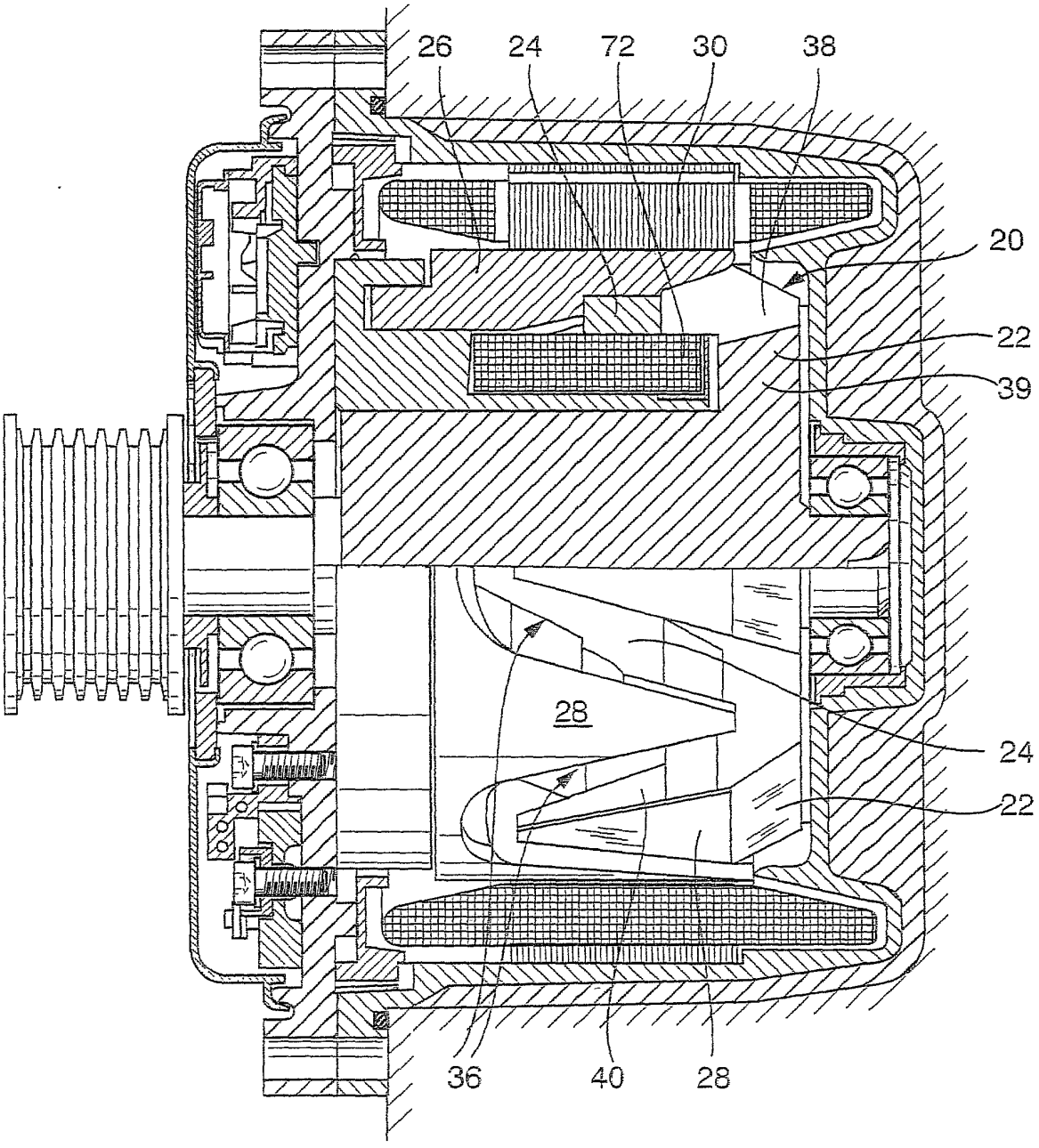

Fig. 18

R. 36159

DECLARATION AND POWER OF ATTORNEY FOR NATIONAL STAGE OF PCT PATENT APPLICATION

As a below-named inventor, I hereby declare that:

Gerhard PFLUEGER
Uwe KNAPPENBERGER

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled **CLAW POLE GENERATOR** the specification of which was filed as PCT International Application number PCT/DE 00/02510 on July 29, 2000.

I hereby state that I believe the named inventor or inventors in this Declaration to be the original and first inventor or inventors of the subject matter which is claimed and for which a patent is sought.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose all information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365 (b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior foreign application(s):			Priority claimed:	
199 39 808.9	GERMANY	AUGUST 21, 1999	X	
(Number)	(Country)	(Date filed)	Yes	No
(Number)	(Country)	(Date filed)	Yes	No

As a named inventor, I hereby appoint the following attorney to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

Michael J. Striker, Reg. No. 27233

Direct all telephone calls to Striker, Striker & Stenby at telephone no.: (631) 549 4700 and address and all correspondence to:

STRIKER, STRIKER & STENBY
103 East Neck Road
Huntington, New York 11743
U.S.A.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such wilful false statement may jeopardize the validity of the application or any patent issued thereon.

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Full Name of First or Sole Inventor: Gerhard PFLUEGER	Citizenship: GERMAN	
Signature: Uwe Knappenberger	Date: 18.04.01	Residence and Full Postal Address: Karlstrasse 11 75417 Muehlacker Germany DEX
Full Name of Second Inventor: Uwe KNAPPENBERGER	Citizenship: GERMAN	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Third Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Fourth Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Fifth Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Sixth Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Seventh Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Eighth Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Ninth Inventor:	Citizenship:	